



## CASE STUDY 11

# BIO-ENERGY

## Environment-friendly stove\*

In southern India, an estimated eight million people are employed in small and tiny businesses. This includes food processing and preparation, textiles, ayurvedic medicines, and brick-making, to name a few. Extrapolating from a recent market survey, there would be about 8,00,000 small commercial kitchens in south India alone. There are several reasons why people opt for working in such conditions. Some of them are poverty, lack of critical skills for employment, and no education. Many such people move from remote villages to small towns in search of work. These small businesses run with small turnovers and their overheads are kept at a minimum in order to achieve a healthy bottom line.

TIDE (Technology Informatics Design Endeavour) has helped create and operationalize a rural enterprise model for disseminating fuel-efficient wood-burning stoves among rural/small town industry clusters. For this, it was awarded the prestigious Ashden Award in 2008. TIDE used the award grant to spin off Sustaintech India Pvt. Ltd as a social venture to demonstrate an enterprise model for the rapid adoption of fuel-efficient stoves by street food vendors. Under this arrangement, TIDE develops fuel-efficient stoves and Sustaintech develops the marketing network. The for-profit enterprise model of Sustaintech has also been conceived as a sustainability plan for TIDE.



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The approach has been to focus on user-friendly stoves that require minimal maintenance. Spares as required are available locally. Fuel is saved through good combustion efficiency by optimizing the air-fuel ratio, the right combustion chamber volume, and use of a well-designed chimney. Good heat transfer efficiency is achieved by maximizing the surface area exposed to heat and minimizing wall losses through good insulation. The programme was initiated in Karnataka and Kerala but has now been expanded to Tamil Nadu, Andhra Pradesh, and Rajasthan.

Most cooks and operators of conventional stoves experience and react to the rising cost of firewood without being aware of the adverse impact of their use on the environment, air quality, pollution, and forests. The rising price of LPG (liquefied petroleum gas) and the fact that firewood is an unregulated fuel is pushing more small businesses to move towards use of firewood as the preferred heat source. Their lifestyle does not permit them to pay attention to the health hazards resulting from prolonged exposure to smoke. Among stove users who purchase fuel, there is interest in adopting fuel-efficient stoves. However, mindset issues and the discomfort with the unknown were preventing them from adopting energy conservation measures.

To mitigate environmental concerns, improve productivity, and profitability of small businesses, and address cultural barriers and health impacts, TIDE developed a range of fuel-efficient stoves for the grassroots businesses. Additionally, it is also offering energy conservation services to the tea industry that uses a lot of firewood for withering and drying of tea.

## TIDE stove designs

TIDE has developed a range of stoves for different industry clusters. Initially, its strategy was to train local masons to construct fuel-efficient stoves. While it still adopts this strategy for large stoves, for example, those used in jaggery making,



textile bleaching, and dyeing, it is gradually moving to factory-produced stoves for uniformity in design, consistent fuel-saving features, lower rejection rates, and quality assurance features. Financing for end users is also easier with factory-produced stoves when compared with on-site constructed stoves that lack standardization. Some of the areas where TIDE has developed and disseminated fuel-efficient wood burning stoves are as follows.

- Large specialized cookstoves for a range of cooking operations (including dosa, frying, and tea-coffee making stoves)
- Customized large cookstoves for big kitchens like those in marriage halls and temples
- Stoves for preparation of herbal medicine, making rubber bands, processing arecanuts, making jaggery, boiling turmeric, and those for textile bleaching and dyeing, and silk reeling



While retaining the core heat-transfer principles, TIDE designs stoves as per usage by the particular sectors, but most importantly, involving the user. This minimizes any modification later.

For factory-produced stoves, the manufacturing site for the stoves is always closer to the location of the end user to the extent possible. TIDE works with fabricators from small towns for different components of the stove: with masons for mud and ceramic part and smiths for metal parts. The large-sized stoves, used in bleaching vats or jaggery units, are built on site, whereas the components for smaller stoves used in silk reeling or boiling areca are made in a production facility and assembled on site.

## Customer care

As a majority of customers are small or medium businessmen and cannot afford even a day's loss in business, TIDE takes care to install the stove without much disruption to their working schedule. Factory-produced stoves make this possible. The customers are initially a little apprehensive about using a new technology. TIDE also arranges sensitization meetings for the stove users. This helps them to clear any doubts and gives a sense of reassurance about the product.

The organization creates awareness and undertakes marketing of the stoves by providing free or subsidized demonstration units to obtain user feedback. However,



there is no subsidy or discount in the sales process to ensure a reasonable profit for the entrepreneur. Some effective ways of reaching the consumer are through vehicle campaigns and participation in exhibitions during village fairs.

## Affordable stoves

The stoves come with a year's guarantee. Like other consumer durables, after-sales service is provided. Entrepreneurs offer service and repair on a chargeable basis post the warranty period and informally check on the working of stoves periodically. When TIDE and Sustaintech were selling stoves to cluster-based industries, the need for consumer financing was not felt very strongly and entrepreneurs offered staggered payment options. However, as the user profile has expanded to reach out to more needy customers, the need for end user financing has been felt and a consumer finance scheme with Madura Microfinance has been operationalized in Tamil Nadu for factory-produced stoves.

Sometimes an industry-specific subsidy may be available. For example, the Department of Sericulture, Karnataka, provided a 40% subsidy for silk-reeling stoves, which was paid to the entrepreneurs when the user had paid 60% contribution. The

Hasiru Karnataka scheme of the Forest Department in Karnataka entails working with women stove entrepreneurs and encouraging them to install fuel-efficient smokeless stoves in forest fringe homes.

TIDE lays a lot of emphasis on quality control. It has developed a quality assurance protocol for the factory made stoves. Only stoves that pass the quality assurance parameters are moved from factories to warehouses or user locations. It is mandatory for each entrepreneur to keep a complaint book and TIDE makes random checks on its own system and those installed by the entrepreneurs.

TIDE is also careful about the financial viability of the stoves. The organization, as a rule, discourages the development and commercialization of a biomass heating system if it is not affordable without subsidy support from the industry for which it is intended.

## Improved stove, improved profitability

For the small businessmen, advantages from the improved stoves are two folds; saving on money and increased productivity. According to an assessment by TIDE in 2011, the stoves installed by TIDE and Sustaintech have so far saved Rs 8 crore in fuel costs and 60,000 tonnes of carbon dioxide emissions annually. About 2,00,000 people have benefitted through their interventions.

### Daily cash flow of a typical customer

Revenues: Rs 2500

Expenses: Rs 2200

Profits: Rs 300

Expenses on fuel: Rs 160

Fuel saving through use of PYRO stoves: Rs 70

Cost of a multipurpose stove: Rs 12,000

Payback period through fuel saving: 170–180 days of usage

## Viability of the stove businesses

Stove businesses must create their own distribution channels in rural areas and in small towns because existing channels servicing this segment (selling mobile phones, insurance, and two-wheelers) are neither interested nor competent in selling eco- friendly products. The key challenges are in reaching the customer, catering to the very price-sensitive markets, and developing strong marketing and sales strategies (this is not the norm as stove dissemination has largely been the domain of non profits with different focus and skills).

A commercial cookstove business is innovative and inclusive making an impact on the lives of the underserved. Such businesses are not the norm and a lot of

time and effort is required in building an enabling environment. A lot of expenses have to be incurred in awareness creation and market development. In the short term, a stove business without grant funds would not be viable, but with initial investments from social investors and when a scale of about 4000 stoves/year is reached, it would be a real alternative to a mainstream business.

## Women's enterprises

Women stove builders trained by TIDE have constructed about 20,000 Sarala stoves where the users pay the entire cost of the stove. The women stove builders ask the household to arrange materials locally (bricks, soil, cement pipes, and so on) and charge Rs 100 as their labour charges. Several people are coming forward to donate a smokeless stove. TIDE has converted about nine villages to smokeless villages through these women's enterprises.

This project has helped the women self-help groups in increasing income generation in the areas of fish-drying, cashew nut processing, and drying of coconuts, spices, and other food products.

## Social benefits

Fuel-efficient stoves, with complete combustion of biomass released, significantly lower the percentage of pollutants of incomplete combustion. Health hazards associated with conventional stoves are quite high. About 28% of all deaths in the developing world due to indoor air pollution occur in India. Besides this, several cooks and workers suffer from respiratory and eye-related ailments. Use of fuel-efficient stoves developed at TIDE (with chimney) ensures a safe working atmosphere and increases the productive life span of the workers.

## Economic benefits

The stoves developed and disseminated by TIDE and its partner organizations offer a path out of poverty for small businesses. Use of the stoves ensures a saving of Rs 70–100/day. A stove business also creates employment for different supply chain elements like manufacturers, welders, fitters, masons, transporters, for warehousing and intermediate production centres, marketers, salesmen, and entrepreneurs. It has the potential to generate livelihoods in rural areas and arrest migration.

## Environmental benefits

Large, fuel-efficient biomass stoves for cooking and for industrial applications can reduce fuel consumption by about 40%. This translates to an average of 8–10 tonnes of firewood conserved per stove per year. In the business-as-usual scenario, the global warming per meal or kilogram of output is therefore very high.

## Biomass briquettes: a viable alternative to the use of firewood in industries

TIDE also understood that an option for reducing deforestation was to convert industries currently using firewood to briquettes. If bulk users of firewood migrated to briquettes then the cost of firewood could perhaps be contained and more firewood would be available to the smaller users.

TIDE therefore worked with the tea industry in south India and motivated them to use briquettes. Most factories have indicated that they would prefer to use a combination of firewood and briquettes for tea drying. TIDE understood the briquette-making process, especially the machinery for briquette-making. It figured that drying of biomass was important for increasing the productivity of the briquette plant. TIDE also explored in great detail, the supply chains for loose fuels that go into biomass briquettes. It has offered technical and part financial assistance to three briquetting units to produce and supply briquettes to the tea industries. The calorific value of the briquettes produced in these units is more than 4000 kcal/kg.

To date, TIDE has been able to add a production capacity about 6000 tonnes of briquettes annually. This is low compared to the demand of 2,50,000 tonnes of briquettes annually.

### Conclusion

Cookstove businesses that include the poor are environment-friendly and profitable. Though there are good market opportunities, innovation and adaptation are necessary. Given improved framework conditions and involvement of donor communities in the initial stages, the success rates and ability to deliver social, economic, and environmental benefits would be even higher.